become available as experienced workers transfer to other occupations or leave the labor force.

Employment of cement masons, concrete finishers, segmental pavers, and terrazzo workers, like that of many other workers, is sensitive to the fluctuations of the economy. Workers in these trades may experience periods of unemployment when the level of nonresidential construction falls. On the other hand, shortages of these workers may occur in some areas during peak periods of building activity.

Earnings
In 2000, the median hourly earnings of cement masons and concrete finishers were $13.50. The middle 50 percent earned between $10.55 and $18.41. The top 10 percent earned over $24.22, and the bottom 10 percent earned less than $8.31. Median hourly earnings in the industries employing the largest numbers of cement masons and concrete finishers in 2000 are shown below:

<table>
<thead>
<tr>
<th>Industry</th>
<th>Median Hourly Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masonry, stonework, and plastering</td>
<td>$15.48</td>
</tr>
<tr>
<td>Highway and street construction</td>
<td>14.88</td>
</tr>
<tr>
<td>Concrete work</td>
<td>13.90</td>
</tr>
<tr>
<td>Nonresidential building construction</td>
<td>13.00</td>
</tr>
<tr>
<td>Residential building construction</td>
<td>11.31</td>
</tr>
</tbody>
</table>

In 2000, the median hourly earnings of terrazzo workers and finishers were $15.06 and median annual earnings of segmental pavers were $12.46.

Like those of other construction trades workers, earnings of cement masons, concrete finishers, segmental pavers, and terrazzo workers may be reduced on occasion because poor weather and downturns in construction activity limit the time they can work. Cement masons, often work overtime, with premium pay, because concrete has been placed, the job must be completed.

Many cement masons, concrete finishers, segmental pavers, and terrazzo workers belong to the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or to the International Union of Bricklayers and Allied Craftworkers. Some terrazzo workers belong to the United Brotherhood of Carpenters and Joiners of the United States. Nonunion workers generally have lower wage rates than union workers. Apprentices usually start at 50 to 60 percent of the rate paid to experienced workers.

Related Occupations
Cement masons, concrete finishers, segmental pavers, and terrazzo workers combine skill with knowledge of building materials to construct buildings, highways, and other structures. Other occupations involving similar skills and knowledge include brickmasons, blockmasons, and stone masons; carpenters, floor, and tile installers and finishers; drywall installers, ceiling tile installers, and tapers; and plasterers and stucco masons.

Sources of Additional Information
For information about apprenticeships and work opportunities, contact local concrete or terrazzo contractors, locals of unions previously mentioned, a local joint union-management apprenticeship committee, or the nearest office of the State employment service or apprenticeship agency.

For general information about cement masons, concrete finishers, segmental pavers, and terrazzo workers, contact:

- Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 14405 Laurel Place, Suite 300, Laurel, MD 20707. Internet: [http://www.concrete-plaster.com](http://www.concrete-plaster.com)

### Construction and Building Inspectors

| O*NET 47-4011.00 |

**Significant Points**

- About half of all inspectors worked for local governments, primarily municipal or county building departments.
- Opportunities should be best for experienced construction supervisors and craftworkers who have some college education, engineering or architectural training, or certification as construction inspectors or plan examiners.

**Nature of the Work**

Construction and building inspectors examine the construction, alteration, or repair of buildings, highways and streets, sewer and water systems, dams, bridges, and other structures to ensure compliance with building codes and ordinances, zoning regulations, and contract specifications. Building codes and standards are the primary means by which building construction is regulated in the United States to assure the health and safety of the general public. Inspectors make an initial inspection during the first phase of construction, and follow-up inspections throughout the construction project to monitor compliance with regulations. However, no inspection is ever exactly the same. In areas where certain types of severe weather or natural disasters are more common, inspectors monitor compliance with additional safety regulations designed to protect structures and occupants during these events.

**Building inspectors** inspect the structural quality and general safety of buildings. Some specialize in such areas as structural steel or reinforced concrete structures. Before construction begins, **plan examiners** determine whether the plans for the building or other structure comply with building code regulations and if they are suited to the engineering and environmental demands of the building site. Inspectors visit the worksite before the foundation is poured to inspect the soil condition and positioning and depth of the footings. Later, they return to the site to inspect the foundation after it has been completed. The size and type of structure, as well as the rate of completion, determine the number of other site visits they must make. Upon completion of the project, they make a final comprehensive inspection.

In addition to structural characteristics, a primary concern of building inspectors is fire safety. They inspect structures’ fire sprinklers, alarms, and smoke control systems, as well as fire exits. Inspectors assess the type of construction, building contents, adequacy of fire protection equipment, and risks posed by adjoining buildings.

In the past, most localities based their building codes on regional model codes established by the Building Officials and Code Administration (BOCA), the International Conference of Building Officials (ICBO), or the Southern Building Code Congress International (SBCCI). Therefore, building inspectors in one region who were experts in one code found it difficult to move to an area of the
country using another code. To eliminate differences among the three sets of codes, these organizations jointly created the International Code Council (ICC), which released the Nation’s first set of uniform building code regulations. This makes it much easier for construction and building inspectors to move to different regions within the United States.

There are many types of inspectors. Electrical inspectors examine the installation of electrical systems and equipment to ensure that they function properly and comply with electrical codes and standards. They visit worksites to inspect new and existing sound and security systems, wiring, lighting, motors, and generating equipment. They also inspect the installation of the electrical wiring for heating and air-conditioning systems, appliances, and other components.

Elevator inspectors examine lifting and conveying devices such as elevators, escalators, moving sidewalks, lifts and hoists, inclined railways, ski lifts, and amusement rides.

Mechanical inspectors inspect the installation of the mechanical components of commercial kitchen appliances, heating and air-conditioning equipment, gasoline and butane tanks, gas and oil piping, and gas-fired and oil-fired appliances. Some specialize in boilers or ventilating equipment as well.

Plumbing inspectors examine plumbing systems, including private disposal systems, water supply and distribution systems, plumbing fixtures and traps, and drain, waste, and vent lines.

Public works inspectors ensure that Federal, State, and local government construction of water and sewer systems, highways, streets, bridges, and dams conforms to detailed contract specifications. They inspect excavation and fill operations, the placement of forms for concrete, concrete mixing and pouring, asphalt paving, and grading operations. They record the work and materials used so that contract payments can be calculated. Public works inspectors may specialize in highways, structural steel, reinforced concrete, or ditches. Others specialize in dredging operations required for bridges and dams or for harbors.

Home inspectors generally conduct inspections of newly built or previously owned homes. Increasingly, prospective home buyers hire home inspectors to inspect and report the condition of a home’s systems, components, and structure. They typically are hired either immediately prior to a purchase offer on a home, or as a contingency to a sales contract. In addition to structural quality, home inspectors must be able to inspect all home systems and features, from plumbing, electrical, and heating or cooling systems to roofing.

The owner of a building or structure under construction employs specification inspectors to ensure that work is done according to design specifications. They represent the owner’s interests, not those of the general public. Insurance companies and financial institutions also may use specification inspectors.

Details concerning construction projects, building and occupancy permits, and other documentation generally are stored on computers so that they can easily be retrieved, kept accurate, and updated. For example, inspectors may use laptop computers to record their findings while inspecting a site. Most inspectors use computers to help them monitor the status of construction inspection activities and keep track of issued permits.

Although inspections are primarily visual, inspectors may use tape measures, survey instruments, metering devices, and test equipment such as concrete strength measurers. They keep a log of their work, take photographs, file reports, and, if necessary, act on their findings. For example, construction inspectors notify the construction contractor, superintendent, or supervisor when they discover a code or ordinance violation or something that does not comply with the contract specifications or approved plans. If the problem is not corrected within a reasonable or specified period, government inspectors have authority to issue a “stop-work” order.

Many inspectors also investigate construction or alterations being done without proper permits. Inspectors who are employees of municipalities enforce laws pertaining to the proper design, construction, and use of buildings. They direct violators of permit laws to obtain permits and submit to inspection.

Working Conditions
Construction and building inspectors usually work alone. However, several may be assigned to large, complex projects, particularly because inspectors tend to specialize in different areas of construction. Though they spend considerable time inspecting construction worksites, inspectors also spend time in a field office reviewing blueprints, answering letters or telephone calls, writing reports, and scheduling inspections.

Inspection sites are dirty and may be cluttered with tools, materials, or debris. Inspectors may have to climb ladders or many flights of stairs, or crawl around in tight spaces. Although their work generally is not considered hazardous, inspectors, like other construction workers, wear hard hats and adhere to other safety requirements while at a construction site.

Inspectors normally work regular hours. However, they may work additional hours during periods when a lot of construction is taking place. Also, if an accident occurs at a construction site, inspectors must respond immediately and may work additional hours to complete their report.

Employment
Construction and building inspectors held about 75,000 jobs in 2000. Local governments, primarily municipal or county building departments, employed 49 percent. Employment of local government inspectors is concentrated in cities and in suburban areas undergoing rapid growth. Local governments employ large inspection staffs, including many plan examiners or inspectors who specialize in structural steel, reinforced concrete, boiler, electrical, and elevator inspection.

Another 17 percent of construction and building inspectors worked for engineering and architectural services firms, conducting inspections for a fee or on a contract basis. Many of these are home inspectors working on the behalf of potential real estate purchasers. Most of the remaining inspectors were employed in other services industries or by State governments.
Training, Other Qualifications, and Advancement

Although requirements vary considerably depending upon where one is employed, individuals who want to become construction and building inspectors should have a thorough knowledge of construction materials and practices in either a general area, such as structural or heavy construction, or in a specialized area, such as electrical or plumbing systems, reinforced concrete, or structural steel. Applicants for construction or building inspection jobs need several years of experience as a construction manager, supervisor, or craftworker. Many inspectors previously worked as carpenters, electricians, plumbers, or pipefitters.

Because inspectors must possess the right mix of technical knowledge, experience, and education, employers prefer applicants who have formal training as well as experience. Most employers require at least a high school diploma or equivalent, even for workers with considerable experience. More often, employers look for persons who have studied engineering or architecture, or who have a degree from a community or junior college, with courses in building inspection, home inspection, construction technology, drafting, and mathematics. Many community colleges offer certificate or associate degree programs in building inspection technology. Courses in blueprint reading, algebra, geometry, and English also are useful.

Construction and building inspectors must be in good physical condition in order to walk and climb about construction sites. They must also have a driver’s license. In addition, Federal, State, and many local governments may require that inspectors pass a civil service exam.

Construction and building inspectors usually receive much of their training on the job, although they must learn building codes and standards on their own. Working with an experienced inspector, they learn about inspection techniques; codes, ordinances, and regulations; contract specifications; and recordkeeping and reporting duties. They may begin by inspecting less complex types of construction, such as residential buildings, and then progress to more difficult assignments. An engineering or architectural degree is often required for advancement to supervisory positions.

Because they advise builders and the general public on building codes, construction practices, and technical developments, construction and building inspectors must keep abreast of changes in these areas. Continuing education is imperative in this field. Many employers provide formal training programs to broaden inspectors’ knowledge of construction materials, practices, and techniques. Inspectors who work for small agencies or firms that do not conduct training programs can expand their knowledge and upgrade their skills by attending State-sponsored training programs, by taking college or correspondence courses, or by attending seminars sponsored by various related organizations, such as model code organizations.

Most States and cities require some type of certification for employment; even if not required, certification can enhance an inspector’s opportunities for employment and advancement to more responsible positions. To become certified, inspectors with substantial experience and education must pass stringent examinations on code requirements, construction techniques, and materials. The three major model code organizations offer voluntary certification, as do other professional membership associations. In most cases, there are no education or experience prerequisites, and certification consists of passing an examination in a designated field. Many categories of certification are awarded for inspectors and plan examiners in a variety of disciplines, including the designation “CBO,” Certified Building Official, offered by the International Code Council.

Opportunities should be best for highly experienced supervisors and craftworkers who have some college education, engineering or architectural training, or certification as inspectors or plan examiners. Thorough knowledge of construction practices and skills in areas such as reading and evaluating blueprints and plans are essential.

Inspectors are involved in all phases of construction, including maintenance and repair work; and are therefore less likely to lose jobs when new construction slows during recessions. As the population grows and the volume of real estate transactions increases, greater emphasis on home inspections should result in rapid growth in employment of home inspectors. In addition, there should be good opportunities in engineering, architectural, and management services firms due to the tendency of governments—particularly Federal and State—to contract out inspection work, and due to expected growth in private inspection services.

Earnings

Median annual earnings of construction and building inspectors were $38,750 in 2000. The middle 50 percent earned between $30,640 and $47,860. The lowest 10 percent earned less than $24,370, and the highest 10 percent earned more than $56,570. Median annual earnings in the industries employing the largest numbers of construction and building inspectors in 2000 were:

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Generally, building inspectors, including plan examiners, earn the highest salaries. Salaries in large metropolitan areas are substantially higher than those in small local jurisdictions.

Related Occupations

Construction and building inspectors combine knowledge of construction principles and law with an ability to coordinate data, diagnose problems, and communicate with people. Workers in other occupations using a similar combination of skills include architects, except landscape and naval; construction managers; civil engineers; cost estimators; drafters; engineering technicians; and surveyors, cartographers, photogrammetrists, and surveying technicians.

Sources of Additional Information

Information about certification and a career as a construction or building inspector is available from the following model code organizations:

- International Conference of Building Officials, 5360 Workman Mill Rd., Whittier, CA 90601-2298. Internet: http://www.icbo.org

Information about training for construction inspectors is available from:

- International Association of Electrical Inspectors, 901 Waterfall Way, Suite 602, Richardson, TX 75080. Internet: http://www.iaeic.org

Job Outlook

Employment of construction and building inspectors is expected to grow as fast as the average for all occupations through 2010. Growing concern for public safety and improvements in the quality of construction should continue to stimulate demand for construction and building inspectors. In addition to the expected employment growth, some job openings will arise from the need to replace inspectors who transfer to other occupations or leave the labor force. Well-trained workers will have especially favorable opportunities.

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- International Association of Electrical Inspectors, 901 Waterfall Way, Suite 602, Richardson, TX 75080. Internet: http://www.iaeic.org
Information about a career as a home inspector is available from:


For information about a career as a State or local government construction or building inspector, contact your State or local employment service.

## Construction Equipment Operators

(O*NET 47-2071.00, 47-2072.00, 47-2073.01, 47-2073.02)

### Significant Points

- Most construction equipment operators acquire their skills on the job, but formal apprenticeship programs provide more comprehensive training.
- Job opportunities are expected to be good, despite slower-than-average employment growth.
- Hourly pay is relatively high but, because construction equipment operators cannot work in inclement weather, total earnings may be reduced.

### Nature of the Work

Construction equipment operators use machinery to move construction materials, earth, and other heavy materials and to apply asphalt and concrete to roads and other structures. Operators control equipment by moving levers or foot pedals, operating switches, or turning dials. The operation of much of this equipment is becoming more complex as a result of computerized controls. Construction equipment operators may also set up and inspect equipment, make adjustments, and perform minor repairs.

Construction equipment operators include operating engineers and other construction equipment operators; paving, surfacing, and tamping equipment operators; and pile driver operators. **Operating engineers and other construction equipment operators** operate one or several types of power construction equipment. They may operate excavation and loading machines equipped with scoops, shovels, or buckets that dig sand, gravel, earth, or similar materials and load it into trucks or onto conveyors. In addition to the familiar bulldozers, they operate trench excavators, road graders, and similar equipment. Sometimes, they may drive and control industrial trucks or tractors equipped with a forklift or boom for lifting materials, or hitches for pulling trailers. They also may operate and maintain air compressors, pumps, and other power equipment at construction sites. Construction equipment operators who are classified as operating engineers have the capability of operating several different types of construction equipment.

**Paving and surfacing equipment operators** use levers and other controls to operate machines that spread and level asphalt or spread and smooth concrete for roadways or other structures. **Asphalt paving machine operators** turn valves to regulate the temperature and flow of asphalt onto the roadbed. They must take care that the machine distributes the paving material evenly and without voids, and make sure that there is a constant flow of asphalt going into the hopper. **Concrete paving machine operators** move levers and turn handwheels to lower an attachment that spreads, vibrates, and levels wet concrete within forms. They must observe the surface of concrete to identify low spots into which workers must add concrete. They use other attachments to the machine to smooth the surface of the concrete, spray on a curing compound, and cut expansion joints. **Tamping equipment operators** operate tamping machines that compact earth and other fill materials for roadbeds. They may operate machines with interchangeable hammers to cut or break up old pavement and drive guardrail posts into the earth.

**Pile driver operators** operate pile drivers—large machines mounted on skids, barges, or cranes, which hammer piles into the ground. Piles are long heavy beams of wood or steel that are driven into the ground to support retaining walls, bulkheads, bridges, piers, or building foundations. Some pile driver operators work on offshore oil rigs. Pile driver operators move hand and foot levers and turn valves to activate, position, and control the pile-driving equipment.

### Working Conditions

Many construction equipment operators work outdoors, in nearly every type of climate and weather condition. Some machines, including bulldozers, scrapers, and especially tampers and pile drivers, are noisy and shake or jolt the operator. Operating heavy construction equipment can be dangerous. As with most machinery, accidents generally can be avoided by observing proper operating procedures and safety practices. Construction equipment operators can expect to be cold in the winter and hot in the summer, and often get dirty, greasy, muddy, or dusty.

Operators may have irregular hours because work on some construction projects continues around the clock. Some operators work in remote locations on large construction projects, such as highways and dams, or in factory or mining operations.